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MEMBRANE SWITCH
[Menburen Suicchi]

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Claims

1. A membrane switch, characterized by the fact that it includes a membrane substrate in which a central contact and peripheral contacts are formed at a central part and its peripheral parts in at least one switch region of a lower surface by a conductive pattern; a switch plate with a downward convex shape which is arranged in contact with the lower surface of the membrane substrate so that it contacts with said peripheral contacts and strides over the central contact, a base provided with a convex part which is arranged below said membrane substrate and protruded upward from the center of said switch plate; and a push button which is supported in a vertically movable way to a housing above said switch plate and has a lower end formed in a circular ring shape in accordance with the above-mentioned peripheral contacts.

2. The membrane switch of Claim 1, characterized by the fact that an electrostatic insulating sheet is placed on the upper surface of the membrane surface.

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[1] Numbers in the margin indicate pagination in the foreign text.

Detailed explanation of the invention

[0001]

(Industrial application field)

The present invention pertains to a membrane switch. In particular, the present invention pertains to a membrane switch in which the infiltration of a static electricity into a contact part is excluded.

[0002]

(Prior art)

Such a membrane switch, for example, has been constituted as shown in Figure 4. In other words, in Figure 4, a membrane switch 1 consists of a membrane substrate 2, a central contact 3 formed in a switch region of the upper surface of said membrane substrate 2 by a conductive pattern, peripheral contacts 4 which are adjacent to the above-mentioned central contact 3 and are formed at the peripheral parts of the switch region of said membrane substrate 2, a switch plate 5 with an upward convex shape which contacts with said peripheral contacts 4 and is mounted on the membrane substrate 2 so that it strides over the central contact 3, a seal 6 mounted to cover said switch plate 5, and a push button 8 which is supported in a vertically movable way to a housing 7 above the center of said switch plate 5.

[0003] The above-mentioned membrane substrate 2, for example, is formed of a PET film.

[0004] The above-mentioned switch plate 5 is formed of a conductive material with elasticity and elastically deformed when its central part is pressed downward, and the lower surface of its central part contacts with the above-mentioned central contact 3.

[0005] The above-mentioned seal 6 is provided with an air hole 6a for discharging the air in a space below said switch plate 5 when the central part of the switch plate 5 is deformed downward by the press of the push button 8.

[0006] The above-mentioned push button 8 is provided with a boss part 8, which is protruded to press the central part of the switch plate 5, at the central part of its lower end.

[0007] According to the membrane switch 1 constituted in this manner, if the upper surface of the push button 8 is pressed by fingers, etc., the tip of the boss part 8a extending to the lower side of said push button 8 presses the central part of the switch plate 5 downward. The central part of said switch plate 5 is thus elastically deformed downward, and the lower surface of the central part of said switch plate 5 contacts with the central contact 3 formed on the membrane substrate 2. Therefore,

the peripheral contacts 4 formed at the peripheral parts of the membrane substrate 2 are electrically connected to the central contact 3 on the membrane substrate 2 via said switch plate 5, so that the switch is turned on.

[0008] At that time, during the elastic deformation to the lower side of said switch plate 5, since the air in the space below the switch plate 5 is discharged to the upper side of said seal 6 from the air hole 6a of the seal 6, the switch plate 5 can be smoothly deformed downward.

[0009]

(Problems to be solved by the invention)

However, in the membrane switch 1 with the above constitution, when a static electricity infiltrates into it from a gap between the housing 7 and the push button 8, the static electricity arrives at the switch plate 5 from the air hole 6a of the seal 6 and is stored in said switch plate 5. For this reason, the static electricity stored in said switch plate 5 was sometimes discharged to the central contact 3 or between the peripheral contacts 4, and the switch characteristics were lowered.

[0010] For these reasons, in case a countermeasure to the static electricity was taken by pasting an electrostatic seal made of aluminum, etc., on the upper surface of the

above-mentioned seal 6, the sense of operation of the push button 8 was damaged.

[0011] The present invention considers the above points, and its purpose is to provide a membrane switch in which a static electricity is countermeasured without damaging the sense of operation by a simple constitution.

[0012]

(Means to solve the problems)

In order to achieve the above-mentioned purpose, the present invention provides a membrane switch characterized by the fact that it includes a membrane substrate in which a central contact and peripheral contacts are formed at a central part and its peripheral parts in at least one switch region of a lower surface by a conductive pattern; a switch plate with a downward convex shape which is arranged in contact with the lower surface of the membrane substrate so that it contacts with said peripheral contacts and strides over the central contact, a base provided with a convex part which is arranged below said membrane substrate and protruded upward from the center of said switch plate; and a push button which is supported in a vertically movable way to a housing above said switch plate and has a lower end formed in a circular ring shape in accordance with the above-mentioned peripheral contacts.

[0013] In the membrane switch of the present invention, an electrostatic insulating sheet is preferably placed on the upper surface of the membrane surface.

[0014]

(Operation)

According to the above-mentioned constitution, during

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the operation of the switch, if the push button is pressed by fingers, etc., the lower end with a circular ring shape of said push button pressed the region of the peripheral contacts of the membrane substrate. The entire switch region of the membrane substrate is thus moved downward, so that the central part of the switch plate is pressed to the convex part on said base. Therefore, the central part of said switch plate is relatively elastically deformed upward, and the central part of said switch plate contacts with the central contact of the lower surface of the membrane substrate. The peripheral contacts of the switch region of the membrane substrate can be connected to the central contact via the switch plate.

[0015] Here, since the central contact, the peripheral contacts, and the switch plate on the membrane substrate are positioned below the membrane substrate, even if a static electricity infiltrates from the gap between the

housing and the push button, the static electricity is difficult to be infiltrated into the lower side of the membrane substrate by the existence of the membrane substrate. The membrane switch in which an effective electrostatic countermeasure is taken can be obtained.

[0016] In case the electrostatic insulating sheet is placed on the upper surface of the membrane substrate, since the static electricity that advances toward the membrane substrate can be completely shielded, a more effective electrostatic countermeasure can be realized.

[0017]

(Application examples)

Next, the present invention will be explained in detail based on application examples shown in the figures. Figure 1 shows an application example of the membrane switch of the present invention. In other words, in Figure 1, a membrane switch 10 consists of a membrane substrate 11, a central contact 12 which is formed in a switch region of a lower surface of said membrane substrate 11, peripheral contacts 13 which are adjacent to the above-mentioned central contact 12 and are formed at the peripheral parts of the switch region of said membrane substrate 11, a switch plate 14 with a downward convex shape which contacts with said peripheral contacts 13 and

is arranged in contact with the lower surface of the membrane substrate 11 so that it strides over the central contact 12, a seal 15 arranged to cover said switch plate 14, a base 16 provided with a convex part 16a which is arranged below said membrane substrate 11 and protruded upward from the center of said switch plate 14, and a push button 18 which is supported in a vertically movable way to a housing 17 above the center of said switch plate 14 and has a lower end formed in a circular ring shape in accordance with the above-mentioned peripheral contacts 13.

[0018] The above-mentioned membrane substrate 11, for example, is formed of a PET film.

[0019] The above-mentioned switch plate 14 is formed of a conductive material with elasticity and elastically deformed when its central part is pressed upward, and the upper surface of the central part can contact with the above-mentioned central contact 12.

[0020] The above-mentioned seal 15 is provided with an air hole 15a for discharging the air in a space above said switch plate 14 when the central part of the switch plate 14 is deformed upward by the press of the push button 18.

[0021] The lower end 18a of the above-mentioned push button 18 is formed in a circular ring shape corresponding to the above-mentioned peripheral contacts 13.

[0022] The membrane switch 10 of the application example of the present invention is constituted as mentioned above. If the upper surface of the push button 18 is pressed by fingers, etc., the lower end 18a with a circular ring shape of said push button 18 presses the part corresponding to the peripheral contacts 13 of the switch region of the membrane substrate 11. Therefore, the entire switch region of the membrane substrate 11 is moved downward, so that the central part of the switch plate 14 is pressed against the convex part 16a on said base 16.

[0023] The central part of said switch plate 14 is thus relatively elastically deformed upward, so that the central part of said switch plate 14 contacts with the central contact 12 of the lower surface of the membrane substrate 11. Therefore, the peripheral contacts 13 of the switch region of the membrane substrate 11 are electrically connected to the central contact 12 via said switch plate 14, so that the switch is turned on.

[0024] At that time, during the elastic deformation to the lower side of said switch plate 14, since the air in the space above the switch plate 14 is discharged to the lower side of said seal 15 from the air hole 15a of the seal 15, the switch plate 14 can be smoothly deformed downward.

[0025] Here, in case a static electricity infiltrates from the gap between the housing 17 and the push button 18, since the central contact 12, peripheral contacts 13, and switch plate 14 on the membrane substrate 11 are positioned below the membrane substrate 11, the static electricity is difficult to be infiltrated into the membrane substrate via the air hole 15a of the seal 15 by the existence of the membrane substrate 11 formed of PET. Therefore, an effective electrostatic countermeasure can be realized.

[0026] Figure 2 shows another application example of the membrane switch of the present invention. In other words, in Figure 2, a membrane switch 20 has the same constitution as that of the membrane switch 10 of Figure 1 except that an electrostatic insulating sheet 21 made of aluminum is pasted on the upper surface of the membrane substrate 11.

[0027] According to the membrane switch 20 with this constitution, it acts similarly to the membrane switch 10 of Figure 1, and a static electricity infiltrated into it from the gap between the housing 17 and the push button 18 is completely shielded by the electrostatic insulating sheet 21 by the existence of the above-mentioned electrostatic insulating sheet 21. Therefore, the static electricity does not arrive at the membrane substrate 11,

and a more effective electrostatic countermeasure can be realized.

[0028] Figure 3 further shows another application example of the membrane switch of the present invention. In other words, in Figure 3, a membrane switch 30 has the same constitution as that of the membrane switch 20 of Figure 2 except that an electrostatic insulating sheet 31 is

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arranged on the upper surface of the membrane substrate 11. In this case, the electrostatic insulating sheet 31 is constituted by an electrostatic insulating pattern 32 formed by a conductive pattern at the same time of the above-mentioned central contact 12 and peripheral contacts 13 on the upper surface of a return part 11a made of PET integrated with the membrane substrate 11.

[0029] According to the membrane switch 30 with this constitution, it acts similarly to the membrane switch 20 of Figure 2, and a static electricity infiltrated into it from the gap between the housing 17 and the push button 18 is completely shielded by the electrostatic insulating sheet 31 by the existence of the above-mentioned electrostatic insulating sheet 31. Therefore, the static electricity does not arrive at the membrane substrate 11, and a more effective electrostatic countermeasure can be

realized. In addition, since the above-mentioned electrostatic insulating sheet 31 is integrated with the membrane substrate 11 and the electrostatic insulating pattern 32 can be formed by the same process as that of the central contact 12 and the peripheral contacts 13, the cost can be further reduced, compared with the case where another electrostatic insulating sheet 21 is pasted on the upper surface of the membrane substrate 11.

[0030]

(Effects of the invention)

As mentioned above, according to the present invention, since a central contact, peripheral contacts, and a switch plate on a membrane substrate are positioned below the membrane substrate, even if a static electricity infiltrates from the gap between a housing and a push button, the static electricity is difficult to be infiltrated into the lower side of the membrane substrate by the existence of the membrane substrate. Therefore, a membrane switch in which an effective electrostatic countermeasure is taken can be obtained.

[0031] In this case, due to the upper and lower constitution opposite to the conventional constitution, in which the central contact and the peripheral contacts are formed on the lower surface of the membrane substrate and

the switch plate is arranged below it, the constitution is neither complicated, and the cost is nor raised.

[0032] In case an electrostatic insulating sheet is placed on the upper surface of the membrane substrate, since a static electricity advancing toward the membrane substrate can be completely shielded by the electrostatic insulating sheet, a more effective electrostatic countermeasure can be realized.

[0033] Therefore, according to the present invention, a membrane switch in which an electrostatic countermeasure is taken without damaging the sense of operation can be provided.

Brief description of the figures

Figure 1 is an outlined cross section showing an application example of the membrane switch of the present invention.

Figure 2 is an outlined cross section showing another application example of the membrane switch of the present invention.

Figure 3 is an outlined cross section showing another application example of the membrane switch of the present invention.

Figure 4 is an outlined cross section showing an example of a conventional membrane switch.

Explanation of symbols:

10, 20, 30 Membrane switches

11 Membrane substrate

11a Return part

12 Central contact

13 Peripheral contact

14 Switch plate

15 Seal

15a Air hole

16 Base

16a Convex part

17 Housing

18 Push button

18a Lower end

21, 31 Electrostatic insulating sheets

32 Electrostatic insulating pattern

Figure 1

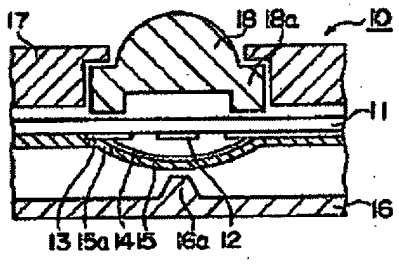

Figure 2

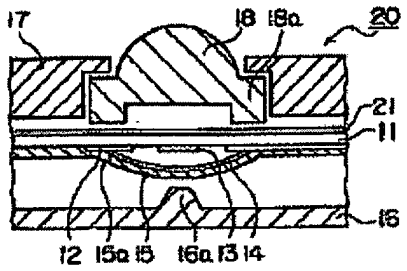

Figure 3

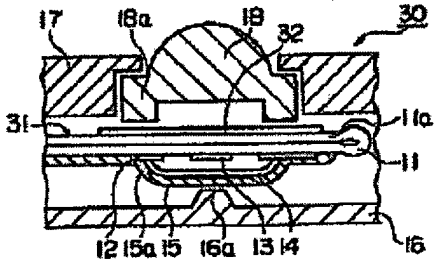

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Figure 4